UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,857	02/09/2004	Ryan Fung	ALT.P027.1 (A1182.1)	9489

27296 7590 09/06/2005

LAWRENCE M. CHO
P.O. BOX 2144
CHAMPAIGN, IL 61825

EXAMINER	
TAT, BINH C	
ART UNIT	**PAPER NUMBER**
2825	

DATE MAILED: 09/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary	Application No.	Applicant(s)
	10/774,857	FUNG ET AL.
	Examiner	Art Unit
	Binh C. Tat	2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to application 10/774857 file on 02/09/04.

Claim 1-55 remain pending in the application.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-55 are rejected under 35 U.S.C. 102(e) as being anticipated by Williams et al. (US Patent 2003/0051222).

3. As to claims 1, and 33, Williams et al. teach a method for designing a system, comprising: determining minimum and maximum delay budgets for connections (see fig 6, 8-10, 11, and 12 paragraph 0055-0058 and paragraph 0061); and selecting routing resources for the connections in response to the minimum and maximum delay budgets (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

4. As to claims 2, and 34, Williams et al. teach wherein determining minimum and maximum delay budgets comprises considering lower and upper delay limits of routed connections based on potential routing possibilities (see fig 8-12 paragraph 0061).

5. As to claims 3, and 35, Williams et al. teach wherein lower delay limits of the routed connections are determined based on an initial selection of routing resources that minimizes connection delays and ignores shorted signals (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

6. As to claims 4, and 36, Williams et al. teach wherein determining minimum and maximum delay budgets comprises starting with initial estimates of final routed delay (see fig 8-12 paragraph 0061 and background).

7. As to claims 5, and 37, Williams et al. teach wherein estimates of final routed delay are determined based on an initial selection of routing resources for connections that minimizes connection delay (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

8. As to claims 6, and 38, Williams et al. teach wherein estimates of final routed delay are determined based on an initial selection of routing resources for connections that ignores shorted signals (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

9. As to claims 7, and 39, Williams et al. teach wherein determining minimum and maximum delay budgets for the connections comprises finding a set of connection delays that attempt to satisfy the short- path and long-path timing constraints (see fig 11, fig 12 paragraph 0060-0061).

10. As to claims 8, and 40, Williams et al. teach wherein determining minimum and maximum delay budgets for the connections comprises allocating short-path and long-path slack (see fig 11, fig 12 paragraph 0028 paragraph 0060-0061).

11. As to claims 9, and 41, Williams et al. teach wherein allocating the delay in order to satisfy the long-path and short-path timing constraints comprises: performing short-path timing analysis to determined short-path slack values (see fig 8-12 paragraph 0028 and paragraph

0061); fixing any short-path violations determined by the short-path timing analysis budgets (see fig 6, 8-10, 11 and 12 paragraph 0058-0065); performing long-path timing analysis to determine long-path slack values (see fig 8-12 paragraph 0028 and paragraph 0061); and fixing any long-path violations determined by the long-path timing analysis budgets (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

12. As to claims 10, Williams et al. teach wherein fixing any short-path violations comprises adding delay in response to the short-path slack values and connection weightings (see fig 8-12 paragraph 0028 and paragraph 0061).

13. As to claims 11, Williams et al. teach wherein the connection weightings are determined by a unit weighting scheme (see fig 6 paragraph 0055-0058).

14. As to claims 12, Williams et al. teach wherein the connection weighting is determined based on how much delay can be added before a practical limit is reached or all relevant violations are resolved. (see fig 6 paragraph 0055-0058 and background)

15. As to claims 13, Williams et al. teach wherein fixing any long-path violations comprises subtracting delay in response to the long-path slack values and connection weightings (see fig 6 paragraph 0055-0058 and background and summary).

16. As to claims 14, and 42 Williams et al. teach wherein allocating the long-path and short-path slack comprises: performing long-path timing analysis to determine long-path slack values (see fig 8-12 paragraph 0028 and paragraph 0061 and summary); allocating long-path slack determined by the long-path timing analysis (see fig 6, 8-10, 11 and 12 paragraph 0058-0065); performing short-path timing analysis to determine short-path slack values (see fig 8-12

paragraph 0028 and paragraph 0061 and summary); and allocating short-path slack determined by the short-path timing analysis (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

17. As to claims 15, Williams et al. teach wherein allocating long-path slack comprises adding delay to temporary delays in response to the long-path slack values and connection weightings (see fig 8-12 paragraph 0028 and paragraph 0061).

18. As to claims 16, Williams et al. teach wherein the connection weightings are determined by a unit weighting scheme (see fig 6 paragraph 0055-0058).

19. As to claims 17, Williams et al. teach wherein the connection weighting is determined based on how much delay can be added before a practical limit is reached or all relevant slack is allocated (see fig 6 paragraph 0055-0058 and background).

20. As to claims 18, Williams et al. teach wherein allocating short-path slack comprises subtracting delay from temporary delays in response to the short-path slack values and connection weightings (see fig 6 paragraph 0055-0058 and background and summary).

21. As to claims 19, and 43, Williams et al. teach wherein selecting routing resources for connections in response to the minimum and maximum delay budgets comprises re-selecting the routing resources for connections whose current proposed routes do not meet the minimum and maximum delay budgets (see fig 11, fig 12 paragraph 0060-0061).

22. As to claims 20, and 44, Williams et al. teach wherein selecting routing resources for connections in response to the minimum and maximum delay budgets comprises re-selecting the routing resources for connections that are shorted (see fig 11, fig 12 paragraph 0060-0061).

23. As to claims 21, and 45, Williams et al. teach wherein selecting routing resources for connections in response to the minimum and maximum delay budgets comprises decreasing

minimum delay budgets based on the number of routing iterations that have occurred (see fig 11, fig 12 paragraph 0060-0061).

24. As to claims 22, and 46 Williams et al. teach wherein selecting routing resources for connections in response to the minimum and maximum delay budgets comprises increasing maximum delay budgets based on the number of routing iterations that have occurred (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

25. As to claims 23, and 47, Williams et al. teach wherein selecting routing resources for connections in response to the minimum and maximum delay budgets comprises utilizing a cost function (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

26. As to claims 24, Williams et al. teach wherein the cost function scores routing resources as candidates for selection in completing a connection route (see fig 11, fig 12 paragraph 0060-0061 and paragraph 0050).

27. As to claims 25, Williams et al. teach wherein the lowest cost routing resource is efficiently tracked via use of a heap (see fig 11, fig 12 paragraph 0060-0061 and paragraph 0050).

28. As to claims 26, Williams et al. teach wherein the cost function for a routing resource is based, in part, on the delay of the respective routing resource (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

29. As to claims 27, Williams et al. teach wherein the cost function for a routing resource is based, in part, on a prediction of the delay to reach the destination from the respective routing resource (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

30. As to claims 28, Williams et al. teach wherein the cost function for a routing resource is based. in part, on how the total estimated routing delay of the connection if the routing resource is used compares with the minimum and maximum delay budget of the connection (see fig 6, 8-10, 11 and 12 paragraph 0058-0065 and background).

31. As to claims 29, Williams et al. teach wherein the cost function for a routing resource is based, in part, on the number of competing signals that want to use the respective routing resource (see fig 11, fig 12 paragraph 0060-0061 and summary).

32. As to claims 30, Williams et al. teach further comprising increasing the penalty associated with several competing signals wanting to use the same resource in the cost function as connection re- routing attempts occur (see fig 11, fig 12 paragraph 0060-0061).

33. As to claims 31, Williams et al. teach further comprising increasing the penalty associated with several competing signals wanting to use the same resource in the cost function, based, in part, on how many signals wanted to use the resource in previous routing attempts(see fig 11, fig 12 paragraph 0060-0061).

34. As to claims 32, Williams et al. teach further comprising increasing the penalty associated with several competing signals wanting to use the same resource in the cost function, based, in part, on how many routing iterations have occurred (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

35. As to claims 48, Williams et al. teach a system designer, comprising: a slack allocator unit that generates minimum and maximum delay budgets for connections from long-path and short-path timing constraints (see fig 6, 8-10, 11, and 12 paragraph 0055-0058 and paragraph 0061); and a routing unit that selects routing resources in a system to route the connections in

response to the minimum and maximum delay budgets (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

36. As to claims 49, Williams et al. teach wherein the slack allocator comprises a timing analysis unit that generates long-path and short-path slack values for the connections in response to connection delays and the long-path and short-path timing constraints (see fig 6, 8-10, 11 and 12 paragraph 0058-0065).

37. As to claims 50, Williams et al. teach wherein the slack allocator comprises a delay adjustment unit that modifies a set of temporary connection delays in order to attempt to satisfy the long-path and short-path timing constraints (see fig 6, 8-10, 11 and 12 paragraph 0058-0065 and summary).

38. As to claims 51, Williams et al. teach wherein the slack allocator comprises a delay adjustment unit that modifies a set of temporary connection delays to allocate long-path and short-path slack (see fig 8-12 paragraph 0028 and paragraph 0061).

39. As to claims 52, Williams et al. teach wherein decreasing minimum delay budgets based on the number of routing iterations that have occurred comprises decreasing the minimum delay budgets of connections that are competing for routing resources other connections want (see fig 6 and fig 11-12 paragraph 0055-0058 and paragraph 0061).

40. As to claims 53, Williams et al. teach wherein increasing maximum delay budgets based on the number of routing iterations that have occurred comprises increasing the maximum delay budgets of connections that are competing for routing resources other connections want (see fig 6 and fig 11-12 paragraph 0055-0058 and paragraph 0061).

41. As to claims 54, Williams et al. teach wherein the cost function for a routing resource is based, in part, on the delay incurred reaching the respective routing resource from the connection source (see fig 11, fig 12 paragraph 0060-0061 and paragraph 0050).

42. As to claims 55, Williams et al. teach wherein the prediction of the delay to reach the destination from the respective routing resource is based, in part, on the minimum and maximum delay budget (see fig 11, fig 12 paragraph 0060-0061).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh C. Tat whose telephone number is 571 272-1908. The examiner can normally be reached on 7:30 - 4:00 (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mathew Smith can be reached on 571 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh Tat
Art unit 2825
July 5, 2004

THUAN DO
Primary examiner.
9/01/2005